SCOTTISH FUTURES TRUST

Appendix C:
Futures Thinking

Contents

1 Futures Thinking

1.1 Role of this analysis

This appendix highlights our futures thinking analysis which informed the identification of the key Drivers of Change as set out in Section 3 of our main report:

- Demographics
- Public service reform
- Climate change
- Economic priorities
- Global security

These drivers have been used throughout the Needs Assessment. In particular, in the main report they are reflected against sectoral reviews, drawing out both sectoral and system issues to be considered. The methodology in this appendix is provided to show the journey to identifying these key drivers, illustrating the approach taken. We do not replicate the driver detail in this appendix, instead Section 3 should be referred to in the main report.

1.2 Futures thinking analysis

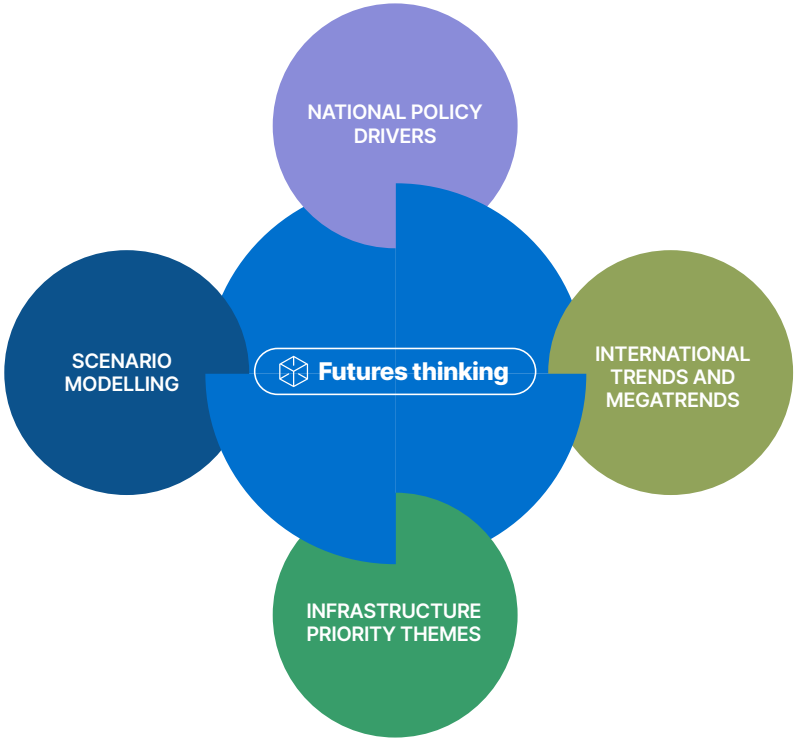
Futures thinking allows us to reflect on possible opportunities to be developed while also identifying challenges to understand, and where appropriate address. Policymakers include futures thinking in their analysis, although timeframes and application can vary.

With the broad definition of infrastructure in Scotland covering economic, social and natural infrastructure, this Needs Assessment for the first time seeks to capture the breadth of opportunities and challenges that could impact across all Scotland's infrastructure over the long term.

Within this supporting appendix, we illustrate considered national and international drivers, and trends, in addition to sector-only issues; alongside scenario modelling a selection of discrete futures, which were influenced by stakeholder priorities at a point in time. This analysis coalesced into the Drivers of Change in our main report.

Figure 1 below highlights the components of the futures thinking approach; with the remainder of this section summarising this analysis across two sections of scenario modelling and drivers.

Figure 1: Futures Thinking Components



1.3 Analytical output

This appendix includes:

- A summary of scenario modelling, building on the historical relationship of infrastructure sectors to demographic and economic impacts, to understand possible influences our infrastructure needs to respond to in the next 30 years. The data from this modelling informed an understanding of a discrete group of variables and their interaction with infrastructure, including the range of possible impacts. This analysis fed into the drivers review, providing nuance where variables and drivers overlapped, such as demographics, and added further insights in others such as consumer behaviour.
- The methodology to identify drivers considered to affect the future of Scotland's infrastructure. This was identified from Scotland's national policy including national infrastructure policy, alongside international trends and megatrends. These guided us on opportunities and challenges and were coalesced into a smaller number of influential drivers included in Section 3 of the main report.

While both outputs are stand-alone, it will be seen that some elements were mutually reinforcing. In particular the variables chosen for the scenario modelling will be seen to be consistent with some of the drivers of change, although identified through a different approach. While only in a couple of areas, this commonality allowed the output from the scenario modelling to further inform our understanding of those drivers; while the drivers output reinforced the scenario modelling messages.

2 Summary of Scenario Modelling (Modelled Discrete Trends)

2.1 Scenario modelling

We undertook scenario modelling in 2022, delivered via an economic model developed by Cambridge Econometrics. The scenario modelling built upon historic data and brought together three variables identified as important through stakeholder workshops: economy, demographics and consumer behaviour. Economy and population are the data elements that were adjusted according to scenario assumptions, with consumer behaviour influencing those variables. For each of these variables two possible future themes were identified and combined to create two alternative scenarios, with the final timeframes a comparison between 2023 data and 2045 projections.

Through workshops with key stakeholders, as summarised in Appendix A, options were explored and the themes identified in Table 1 were chosen to be modelled i.e. the economic themes of Green Industrial Revival and Service Led Economy, the demographic themes of Open Scotland and Declining and Ageing, and finally the behavioural themes of Ethical and Sustainable versus Prosperity and Consumption. Significant data across Scotland's infrastructure landscape supported this modelling.

Table 1: Scenario Modelling

SCENARIOS	SCENARIO VARIABLES		
	Economy	Population	Behaviour
Baseline Scenario	Baseline	Baseline	Baseline
Alternative Scenario 1	Green Industrial Revival	Open Scotland	Ethical and Sustainable
Alternative Scenario 2	Service Led Economy	Declining and Ageing	Prosperity and Consumption

Interaction of these themes and their contrasting futures provided opportunities and challenges e.g. the opportunities of a green industrial revolution versus a service-led economy alone; the challenge of a declining and ageing population versus greater inward migration; and how consumption patterns may support greater economic growth than an ethical and sustainable consumption pattern. Collectively these provided two rich scenarios to explore alongside a status-quo baseline scenario. Scenario modelling in this way is a type of sensitivity testing, with alternative scenarios assessing the variation from the baseline model.

2.2 Limitations of scenario modelling

The single consistent approach to scenario modelling allowed us to paint a picture of possible futures across a large group of sectors, using the same variables (population, economy, and consumer behaviour). There are however limitations, which we highlight here.

This kind of scenario modelling, referred to as a Local Economy Forecasting Model (LEFM) provides demand data and does not reflect policy supply decisions. For example, there are many valid reasons why a projected demand reduction or increase would see the opposite policy response. Historic under-investment, localised variation, or a significant change in policy by different governments, are only a few examples.

To be sufficiently robust, scenario modelling needs to limit the number of variables and how these are altered. In reality, there are multiple variables and rarely do changes happen in isolation. We chose the variables through stakeholder engagement, however recognised that there were others important to infrastructure decision-making over the longer term.

The model used, while allowing for consistency of methodology, is an economic model, based on historic patterns, not appropriate for all sectors. For example, sectors driven by other and more complex non-economic considerations, or undergoing significant change, such as energy, where historical patterns cannot guide us on future demand.

Additionally, data availability and quality varied across sectors, while changing data created challenges. For example more recent demographic data updated how fast our population is declining, with more immediate increases anticipated, and population reductions, less clear.

The modelling does not allow for sectoral interdependencies, such as increasing spend on policing and whether that would reduce arson and therefore the demand for fire-services. Nor does it allow for spatial

interdependencies such as whether increased spend in one area would create a pull factor influencing other regions.

To manage these limitations, the output of this work is only one input to our analysis and has been considered in combination with the other, primarily qualitative analysis. Policy drivers considered below for example, can help us understand how supply may be affected by policy decisions; while sectoral analysis helps us address areas where a sector is changing significantly; and cross-cutting themes such as data and technology reliance can help us consider whether some of the impacts seen in the scenario modelling are realistic and scale accordingly.

2.3 Scenario baseline trajectory and key messages

The baseline scenario assumed the historical relationship of variables to infrastructure demand was unchanged i.e. population and economy interacted with infrastructure sectors in an established and known way. Some of the changes modelled have been anticipated:

- **Demographic impacts:** At the time of this analysis (since changed), Scotland was seen to have a reducing and ageing population, like many western economies. As we discuss in the main report, updated forecasts paint a more nuanced picture, with reductions in population no longer forecast, during the period to 2045 (the scenario modelling timeline), although population distribution changes continue. Population changes will impact on overall infrastructure demand. The impact varies by sector and there are regional variances creating infrastructure stresses. For social infrastructure, such as education, with falling birth rates, demand will fall for early learning and school places; whereas there is likely to be increased demand for health services with an ageing population. More recent population changes are reviewed in the main report.
- **Demographic impacts:** Demographic changes will also likely see ongoing population movement, including increased urbanisation of Scotland that has been a pattern for some time. There are many nuances to this pattern. This change has particular challenges for some sectors such as water where climate change is impacting on the availability of water in some regions. This is not just a matter for drinking-water, but water to drive industry developments such as hydrogen or datacentres.
- **Economy impacts:** Economic patterns are likely to see long-term economic growth continue (Gross Value Added increase), despite the demographic changes anticipated. There are however sectoral variations in this picture.
- **Regional impacts:** There are likely to also be regional variations, with some areas such as the Southeast continuing the increased economic growth. Again, this is a consistent trend we have been seeing for some time, partially supported by the population distribution patterns.
- **Behaviour effects:** Consumer behaviour for the baseline assumes the current approach to consumption continues, which supports the growth trajectory.

As already noted, scenario data does not provide a narrative on service redesign and policy supply responses. For example, school roll falls may allow for a different approach to education service delivery, supported by technology development, however in support of place and inclusive policies, a different contrasting approach may be taken. Scenario data contributes to effective decision-making and is not information to be considered in isolation. It allows us to consider movement of demand and the possible scale of impacts, when reflected against the chosen variables of population, economy and consumer behaviour.

2.4 Alternative scenarios and key messages

A number of alternative scenarios to the baseline were developed. The long-list of scenarios is not reviewed here, and we focused, as noted in Table 1, on two alternative scenarios. These provided contrasting combinations of variable themes, guiding us on possible challenges and opportunities across a spectrum of futures, reflected against the baseline scenario. This mirrors the opportunities and challenges approach taken across our analysis:

- **Alternative Scenario 1:** Open population with greater inward migration, partially redressing modelled population decline; ethical and sustainable consumer behaviour, reducing economic growth from baseline and seeing more population dispersal and supporting climate mitigation efforts; and green industrial revival, delivering on climate-related green industry opportunities.
- **Alternative Scenario 2:** Closed population with little inward migration, modelled population decline is more acute or sooner; consumer-led growth maintaining overall economic growth and continuing the urbanisation of Scotland; and service-focused economy, sustaining existing economic structures, but not exploiting green industry opportunities significantly.

In assessing the value and role of scenario modelling, it is worth considering that there are possible subsets of each of these scenarios, not modelled, with the consumer behaviour component perhaps the most obvious example. Ethical and sustainable behaviour assumes less consumption and consequently reduced economic growth. This relationship to consumption is a continued dynamic in western economies, as illustrated in the OBR forecasting model and national accounts framework. In challenging the impact of consumer behaviour within the ethical and sustainable behaviour scenario however, it is equally viable that economic growth could be sustained by other demand components such as government or business spending; structural changes within the economy; increased productivity; increased savings; or indeed simply that consumer consumption is replaced i.e. focused on experiences and activities as opposed to goods.

Additionally, does the consumption pattern scenario require ongoing urbanisation, or could it also promote population dispersal? These cannot be taken as absolutes. The important aim of these scenarios is to provide contrasting futures to inform our understanding of possible infrastructure need. The scenarios provide us some areas for consideration, and further testing, while it is for policy development and related investment to drive the preferred outcome, addressing challenges that could undermine those ambitions. This Needs Assessment will identify areas that should be considered by policymakers, in reflecting on some of these possible impacts.

The key messages from the baseline and two alternate scenarios is summarised in Table 2 below. Where available, some sense of scale is added, with data projections between 2023 and 2045 for most areas:

Table 2: Scenario Summary

SOME IMPACTS	ALTERNATE SCENARIO 1: GREEN INDUSTRIAL REVIVAL, OPEN SCOTLAND, ETHICAL AND SUSTAINABLE	BASELINE SCENARIO	ALTERNATE SCENARIO 2: SERVICE-LED ECONOMY, DECLINING & AGEING, PROSPERITY & CONSUMPTION
Population (key variable)	The ageing society is addressed through increased migration, with a 2.23% increase by 2045 on 2023 population figures. Figures illustrate the reliance on migration to address a changing population.	Reducing and ageing society, with an overall 2.83% reduction by 2045 from 2023 figures.	This scenario sees a more extreme example of the baseline, i.e. reducing and ageing faster, with less migration and a 9% reduction by 2045 on 2023 figures. This is the lowest population projection.
Economy (key variable)	There will be less growth than service-led due to societal changes, offsetting some of the higher growth due to green industrial revival, however still giving an overall c2% increase on the 2045 baseline projection.	Ongoing long-term economic growth will increase some demand with some offsets by population changes, with a c31% GVA increase on 2023 figures. This is the lowest GVA projection.	More resource use from increased consumption, providing increase in economic growth compared to 2023 and the baseline, with an overall c4% increase on the baseline 2045 projection.
Infrastructure	The industrial changes see Scotland taking a lead in waste management, recycling, reuse and circular economy. The ethical and sustainable behaviours influence greater demand for natural infrastructure and reduction in others such as personal transport.	Declining population implies demand for most types of infrastructure will fall. Variation will depend on sectoral reliance on population versus economic growth projections. As projections are based on historic supply, which may be below what is needed, some areas would require to be reviewed against policy focus e.g. housing emergency commitments.	Increased rate of change from baseline pattern. For example, a faster reduction in demand for education or increase in health demand due to greater ageing.
Regions and population	There is a faster adaptation to technology, supporting home working and a greater population dispersal, likely to change the urban/rural dynamic to some extent.	Other population trends such as rural population changes will continue. Distribution of changes is likely to be more relevant.	There are regional variances in population due to scenario combinations, however less technological adoption, with less dispersal of populations than in scenario 1 or the baseline.

2.5 How we used modelling output

Scenario work can help us consider a spectrum of futures, supporting risk management, as well as identifying opportunities. In Table 2 we provide the percentage variances in the economy and population projections, supporting some understanding of how sensitive scenarios are to changes.

From our work we have some key messages as noted in Table 2 above. We have considered challenges such as demographic changes that we are already dealing with, alongside the realities of how industrial change through the green revolution could drive added value for all of Scotland if harnessed. The scenario work also reinforces the role of consumers in driving infrastructure demand, whether that be consumption patterns, or use of technology supporting greater population distribution. Table 3 below summarises the consistent messages within the three main variables used within the scenario modelling and how this is considered further within other parts of our analysis.

Table 3: Main variables considerations

MAIN VARIABLE	CONSISTENT SCENARIO CONSIDERATIONS
Population	Population demographics is a variable modelled nationally, therefore with greater consistent data to rely upon. We have seen that population is a dominant variable in impacting on demand, with migration patterns increasingly important to a future Scotland. Our population is ageing and for the data used is expected to decline, although challenged within most recent data. Scenario modelling guides us on some key impacts, such as education, which will see a reduction in demand, while health will see an increase. Scale of changes will vary. The distribution changes will impact across infrastructure too, with some impacts already being seen. Distribution does however have a consumer behaviour component that is more difficult to determine a consistent message from. The scenario output reinforces other areas of the Needs Assessment analysis and the importance of population as a driver of change.
Economy	Our economy is likely to continue to grow over the longer-term irrespective of scenario, building on its strong base. Exploiting the opportunities of a green transition, however, provide significant opportunities for Scotland to grow beyond the baseline, assuming population challenges do not curtail this. Our existing economy requires infrastructure to support its ambitions, whether that be taking goods to market or tourists to our places. Infrastructure changes will be primarily driven by current consumption patterns and the current trajectory. Emerging markets and their balance against current markets will change some of the infrastructure needed, with a focus on green industry requiring new infrastructure, or evolving existing areas such as waste management. While population distribution will have a role in where infrastructure is needed, this will also be influenced by where the opportunities are e.g. associated to offshore wind. This message also reinforces other areas of the Needs Assessment analysis, including managing utilities for development and related placemaking, which will depend on spatial distribution and the impact of emerging markets. Some of these are difficult to project and will be refined by policy ambitions to share growth and the benefits of growth. More simplistically, it emphasises the importance of a focus on our economy, both for existing and emerging sectors.
Consumer behaviour	Consumer behaviour was modelled through varying both demographic and industry data within the model. The main scenario message is simply reinforcing the knowledge that consumer behaviour and therefore demand, can impact on several areas, including consumption patterns, distribution of our population, and the type and scale of growth. Infrastructure policy and supply decisions may alter consumer behaviour to achieve preferred outcomes. This modelling has supported and reinforced other areas of Needs Assessment analysis, by considering how behaviours can have an impact on our infrastructure. For example, consumption patterns and prioritising of purchasing products versus services or activities can reduce demand in some key areas, while increasing others. While not fully explored in the modelling, this may follow generational lines, with the changing demographics having an impact on consumption preferences. Equally, the potential for home working can impact on the distribution of our population, changing urban pressures and even supporting re-population. Overall, consumer behaviour has added to considerations around managing demand within the public services, a component of public service reform.

2.6 Scenario modelling to drivers

We have used the data from this modelling to help:

- Inform an understanding of modelled variables and the scale of possible impacts on infrastructure. This has been used alongside other aspects of our analysis to challenge or reinforce outputs, creating a balanced view of possible influences and their importance.
- Understand the extent to which scenario modelling messages are identified within national policy, which we look at next. For example, demographic patterns are regularly analysed by Scottish government, however, are the challenges of a changing population being expressed in national policy and practice?

Recognising the potential yet limitations of scenario modelling our approach has ensured the scenario modelling has been a valuable but measured addition to our analysis.

3 Policy, Trends and Megatrends

3.1 Identifying drivers of change

Alongside the scenario modelling we considered the role of policy, and external trends and megatrends. Trends are patterns of change, based on long-term data sets. Megatrends are often higher-level changes and are slower to form than trends, but are likely to have more significant global impacts. A recent publication by Scottish Government on Future Trends for Scotland: Findings from the 2024-25 Horizon Scanning Project, identified 60 trends of importance to Scotland. The extent to which these are relevant to infrastructure will vary. While we did not include an explicit review of this analysis, our focus on policy, trends and megatrends aligns with this approach. It is likely the prioritised output this project developed will influence future policy, adding a further layer to future-proofing policy and investment decisions.

We have collectively called the output from our analysis, drivers and within the main report have identified key Drivers of Change, as those drivers particularly relevant, and we believe influential, for longer-term infrastructure decision-making.

Our approach to identify these drivers was three-fold:

1› A review of national policy to identify key policy trends, reviewing the consistency or emphasis of these trends to understand their policy importance. These policies are likely to impact on the direction of infrastructure investment, recognising the long-term nature of infrastructure.

2› A secondary review of infrastructure national policy (as opposed to sectoral policy). Again, priorities are likely to direct investment decisions.

3› Additional drivers relevant to ensure long-term infrastructure is fit for purpose. This also reviewed any common approaches and trend identification internationally.

3.2 National policy trends

In determining priority policy trends, a small number of strategic level national policies, including infrastructure policy were reviewed:

- National Planning Framework
- Infrastructure Investment Plan
- National Strategy for Economic Transformation
- National Performance Framework

This narrow group of policies was included on the basis of their longer-term nature and broad focus. Sectoral policies were considered separately, while short term programmes such as annual Programmes for Government considered less relevant due to their shorter-term focus.

Trends that were considered to impact on the system of infrastructure and supported our analysis of cross-cutting themes were reviewed and where appropriate included in Section 5 of the main report. The following were identified as consistent priority drivers across the reviewed national policies and frameworks:

- **Economic growth and wellbeing economy** and related language and measures – equality, Scottish Index of Multiple Deprivation (SIMD), multiple deprivation, inclusive economic growth, fair work, real living wage, economic growth, investment.
- **Climate related language** and the approach to address the challenge – greenhouse gas emissions; climate change; net zero; low carbon; just transition.
- **Public Services and reform** public sector, government, public.
- **Population** population, migration.
- **Biodiversity and green infrastructure**.

It is important to note that we have included national policy drivers, irrespective of their scale, including whether they are megatrends such as climate change, shared internationally.

3.3 Infrastructure policy

Scottish Government's current Infrastructure Investment Plan (2021/22 – 2025/26) (IIP), A National Mission with Local Impact, identifies three thematic priorities of sustainable places, inclusive growth and environmental sustainability. From our national policy review, these align with economic growth and wellbeing, and climate and biodiversity, showing a level of consistency with the other national priority drivers.

Alongside these themes, a key process priority included in the IIP is an approach to guide investment and to address historic under-investment in maintenance, through an investment hierarchy. This process aligns well with the public services and public service reform focus of the national policy review, ensuring appropriate and efficient use of public assets.

The review of infrastructure policy does not therefore significantly change the set of national policy drivers, only adding a consideration of process and good practice in investment decision-making, which we address in Section 6 of our main report, Enabling Success.

3.4 International trends and megatrends

The final phase of the drivers review took a broader view, assessing what international trends and megatrends external to Scotland's policy should be considered. To capture these, we reviewed what drivers were included in international needs assessments, assessed the common themes and compared these against Scotland's internal policy drivers.

Consistent but nuanced

It was seen that unsurprisingly there is significant commonality of the trends countries are facing and therefore prioritised. These included: climate change and net zero emissions, demographic changes, strengthening resilience, economy including regional economy, productivity and growth, finance and investment and the natural environment.

Some areas were consistent with themes we have captured in our cross-cutting priorities, such as technology developments; or place, in the concept of balanced growth and local need.

The framing of issues and therefore the response, can vary however between countries. For example, the most consistent megatrend is climate change and the necessary response to protect our homes, our industry and environment. Energy security is added more explicitly to this for some economies, framed as a resilience priority against external threats, which as we suggest below is also emerging at a UK level. Demographics are a consideration in most developed countries, however the challenges vary. The economy likewise is central to the plans of most countries, with some focusing on growth as a priority in isolation, whereas some have a more nuanced approach, similar to Scotland; recognising that inclusive economies are necessary to the wellbeing of society. Making the best use of our infrastructure for economic and societal benefit is also a shared priority.

The main additional area we identified was the trend towards global insecurity and a changing narrative of international collaboration. This was included in Scotland's Futures Trend work, recognising geopolitical issues and food security, but not explicit within the national policy we reviewed. The UK Government Chronic Risk Analysis also includes the risk of increased conflict; as well as climate change creating food and water vulnerabilities. Whether it be disputes such as the Russia-Ukraine or Middle East insecurity, existing conflicts are influencing a change of focus on international relations, increased spending on defence, a reduction in international aid, often considered soft-power and an increased focus on resilience. We discuss this in more detail in the main report.

This review created a long-list of drivers, with a strong level of consistency. In the next section we summarise how we coalesced this into a smaller group of drivers, that are further explored in our main report.

4 Futures Thinking Opportunities and Challenges

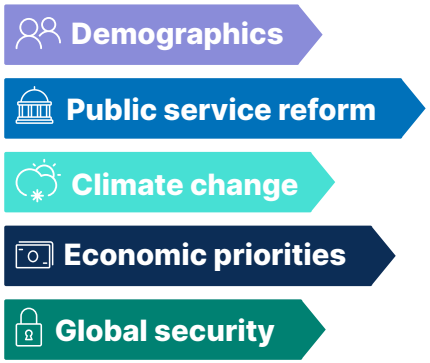
4.1 Consistent messages

This futures-thinking review reflects a strong consistency of opportunities and challenges:

- **Demographics**
  - Ageing population.
  - Spatial changes.
- **Public Service reform**
  - Prevention.
  - Efficiency of the delivery landscape including scale.
  - Better joined up services.
  - Empowerment.
  - Fiscal sustainability.
- **Climate challenge**
  - With resilience requirements driving a different investment trajectory, alongside the opportunities to develop a low carbon and Just Transition.
- **Economic priorities**
  - Including equality, fair work, regional economy and productivity and growth.
- **Global Security**
  - Changing global dynamics.
  - Security and cyber security.
  - Resilience required.
  - Defence strengths.
- **Biodiversity**
  - The natural environment.
  - Green infrastructure opportunities.
- **Finance and investment**

4.2 Building on this analysis

In capturing this analysis within our main report we combined a number of the identified drivers into a priority grouping of Drivers of Change in Section 3, assessed to have a greater influence on long-term infrastructure need:



As noted, areas which were assessed to have a more significant role in a system-thinking approach to infrastructure, were considered in Section 5 of our main report, on cross-cutting themes.

4.3 A balanced analysis

Our approach has sought to balance the more data heavy scenario modelling analysis with a qualitative review of drivers. While there are recognised limitations to the scenario modelling, it allowed us to consider the possible scale of infrastructure impacts, for a discrete group of scenarios. The drivers review with its focus on both internal and external trends, stands alone analytically, but reinforces the choice of scenario modelling variables and therefore key messages. As with all of our work on this first Needs Assessment, it is our intention to systematically review our approach and through ongoing engagement, improve it for the future.

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